Manual No. : KM-1MJ-E
Vol. No. : W1MJ-E-00

Workshop Manual

ZAXIS
27U-2
30U-2
35U-2
Excavator

Service Manual (Manual No. KM-1MJ-E) consists of the following two separate volumes;

Technical Manual	: Vol. No. T1MJ-E
Workshop Manual	: Vol. No. W1MJ-E

HITACHI

INTRODUCTION

TO THE READER

- This manual is written for an experienced technician to provide technical information needed to maintain and repair this machine.
  - Be sure to thoroughly read this manual for correct product information and service procedures.
  - If you have any questions or comments, at if you found any errors regarding the contents of this manual, please contact using “Service Manual Revision Request Form” at the end of this manual.
    (Note: Do not tear off the form. Copy it for usage.):

    Publications Marketing & Product Support
    Hitachi Construction Machinery Co. Ltd.
    TEL: 81-29-832-7173
    FAX: 81-29-831-1162

ADDITIONAL REFERENCES

- Please refer to the materials listed below in addition to this manual.
  - The Operator’s Manual
  - The Parts Catalog
  - Operation Manual of the Engine
  - Parts Catalog of the Engine
  - Hitachi Training Material

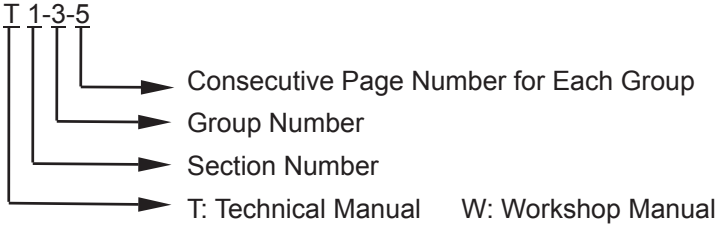
MANUAL COMPOSITION

- This manual consists of two portions:
  the Technical Manual and the Workshop Manual.
  Use the manuals according to purpose.
  - Information included in the Technical Manual:
    technical information needed for redelivery and delivery, operation and activation of all devices and systems, operational performance tests, and troubleshooting procedures.
  - Information included in the Workshop Manual:
    technical information needed for maintenance and repair of the machine, tools and devices needed for maintenance and repair, maintenance standards, and removal/installation and assemble/disassemble procedures.

PAGE NUMBER

- Each page has a number, located on the center lower part of the page, and each number contains the following information:

Example : T 1-3-5



SAFETY ALERT SYMBOL AND HEADLINE NOTATIONS

In this manual, the following safety alert symbol and signal words are used to alert the reader to the potential for personal injury of machine damage.

⚠ This is the safety alert symbol. When you see this symbol, be alert to the potential for personal injury.
Never fail to follow the safety instructions prescribed along with the safety alert symbol.
The safety alert symbol is also used to draw attention to component/part weights.
To avoid injury and damage, be sure to use appropriate lifting techniques and equipment when lifting heavy parts.

- ⚠ **CAUTION:**
  Indicated potentially hazardous situation which could, if not avoided, result in personal injury or death.

- **IMPORTANT:**
  Indicates a situation which, if not conformed to the instructions, could result in damage to the machine.

- *NOTE:*
  Indicates supplementary technical information or know-how.

UNITS USED

- SI Units (International System of Units) are used in this manual.
  MKSA system units and English units are also indicated in parenthheses just behind SI units.

  Example : 24.5 MPa (250 kgf/cm^2, 3560 psi)

  A table for conversion from SI units to other system units is shown below for reference purposees.

Quantity	To Convert From	Into	Multiply By	Quantity	To Convert From	Into	Multiply By
Length	mm	in	0.03937	Pressure	MPa	kgf/cm^2	10.197
	mm	ft	0.003281		MPa	psi	145.0
Volume	L	US gal	0.2642	Power	kW	PS	1.360
	L	US qt	1.057		kW	HP	1.341
	m^3	yd^3	1.308	Temperature	°C	°F	°C×1.8+32
Weight	kg	lb	2.205	Velocity	km/h	mph	0.6214
Force	N	kgf	0.10197		min^{-1}	rpm	1.0
	N	lbf	0.2248	Flow rate	L/min	US gpm	0.2642
Torque	N·m	kgf·m	1.0197		mL/rev	cc/rev	1.0
	N·m	lbf·ft	0.7375				

RECOGNIZE SAFETY INFORMATION

- These are the **SAFETY ALERT SYMBOLS**.
  - When you see these symbols on your machine or in this manual, be alert to the potential for personal injury.
  - Follow recommended precautions and safe operating practices.

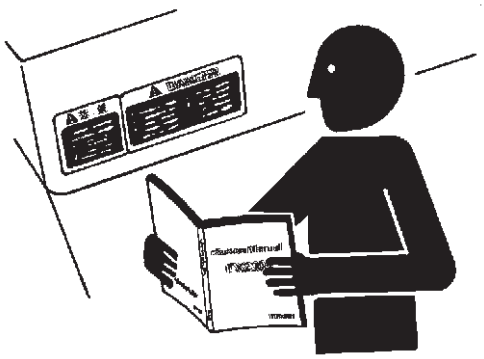
SA-688

UNDERSTAND SIGNAL WORDS

- On machine safety signs, signal words designating the degree or level of hazard - DANGER, WARNING, or CAUTION - are used with the safety alert symbol.
  - **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
  - **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
  - **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.
  - **DANGER or WARNING safety signs** are located near specific hazards. General precautions are listed on **CAUTION safety signs**.
  - Some safety signs don't use any of the designated signal words above after the safety alert symbol are occasionally used on this machine.
- **CAUTION** also calls attention to safety messages in this manual.
- To avoid confusing machine protection with personal safety messages, a signal word **IMPORTANT** indicates a situation which, if not avoided, could result in damage to the machine.
- ***NOTE*** indicates an additional explanation for an element of information.

SA-1223

FOLLOW SAFETY INSTRUCTIONS



SA-003

- Carefully read and follow all safety signs on the machine as well as all safety messages in this manual.
- Safety signs must be installed, maintained and replaced if damaged.
  - If a safety sign or this manual is damaged or missing, order a replacement from your nearest Hitachi dealer in the same way you order other replacement parts (be sure to state machine model and serial number when ordering).
- Allow only properly trained, qualified, authorized personnel to operate the machine.
- Learn how to correctly operate and service the machine.
- Keep your machine in proper working condition.
- Always operate the machine within the specification.
  - Unauthorized modifications of the machine may impair the functions and/or safety and affect machine life and the warranty will become void.
- The safety messages in this SAFETY chapter are intended to illustrate basic safety procedures of machines. However it is impossible for these safety messages to cover every possible hazardous situation you may encounter. If you have any questions concerning safety, you should first consult your supervisor and/or your nearest Hitachi dealer before operating or performing maintenance work on the machine.

PREPARE FOR EMERGENCIES

SA-437

- Be prepared if a fire starts or if an accident occurs.
  - Keep a first aid kit and fire extinguisher on hand.
  - Thoroughly read and understand the label attached on the fire extinguisher and use it properly.
  - To ensure that a fire-extinguisher can be always used when necessary, check and service the fire-extinguisher at the recommended intervals as specified in the fire-extinguisher manual.
  - Establish emergency procedure guidelines to cope with any fire or accidents which may occur.
  - Keep emergency numbers for doctors, ambulance service, hospitals, and fire department posted near your telephone.

WEAR PROTECTIVE CLOTHING

- Wear close fitting clothing and safety equipment appropriate to the job.

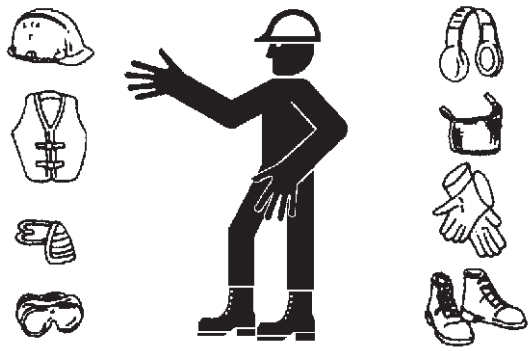
  You may need:
  A hard hat
  Safety belt
  Safety shoes
  Safety glasses, goggles, or face shield
  Heavy gloves
  Hearing protection
  Reflective clothing
  Wet weather gear
  Respirator or filter mask.

  Be sure to wear the correct equipment and clothing for the job. Do not take any chances.

  - Avoid wearing loose clothing, jewelry, or other items that can catch on control levers or other parts of the machine.

- Operating equipment safely requires the full attention of the operator.

  - Do not wear radio or music headphones while operating the machine.



SA-438

PROTECT AGAINST NOISE

- Prolonged exposure to loud noise can cause impairment or loss of hearing.

  - Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortably loud noises.

SA-434

INSPECT MACHINE DAILY

- If any abnormality is found, be sure to repair it immediately before operating the machine.

  - In the walk-around inspection, be sure to cover all points described in the “PRE-START INSPECTION” chapter in the operator’s manual.

SA-435

TIDY UP INSIDE CAB

- Always keep inside the cab clean by observing instructions below, to prevent any personal accidents from occurring.
- Remove mud and/or oily material from the shoe soles before entering the cab. If pedals are operated without removing mud or oily matter, the foot may slip off the pedal, possibly creating a hazardous situation.
- Do not leave parts and/or tools around the operator's seat.
- Do not keep a transparent water bottle in the cab. The transparent water bottle may concentrate the sun light like a lens, possibly causing a fire.
- Do not wear radio or music headphones and do not use a cell phone while traveling or operating the machine.
- Never allow hazardous materials such as combustible and/or explosive material in the cab.
- Do not leave a lighter in the cab. If the temperature in the cab increases, the lighter may explode.

USE HANDHOLDS AND STEPS

- Falling is one of the major causes of personal injury.
  - When you get on and off the machine, always face the machine.
  - Maintain a three-point contact with the steps and handrails.
  - Do not use any controls as handholds.
  - Never jump on or off the machine. Never mount or dismount a moving machine.
  - In case adhered slippery material such as oil, grease, or mud is present on steps, handrails, or platforms, thoroughly remove such material.

SA-439

ADJUST THE OPERATOR'S SEAT

- A poorly adjusted seat for either the operator or for the work at hand may quickly fatigue the operator leading to mis-operation of the machine.
  - The seat should be adjusted whenever the operator for the machine changes.
  - The operator should be able to fully depress the pedals and to correctly operate the control levers with his back firmly against the seat back.
  - If not, readjust the seat forward or backward, and check again.

SA-378

FASTEN YOUR SEAT BELT

- If the machine should overturn, the operator may become injured and/or thrown from the cab. Additionally the operator may be crushed by the overturning machine, resulting in serious injury or death.
  - Be sure to remain seated with the seat belt securely fastened whenever operating the machine.
  - Prior to operating the machine, thoroughly examine webbing, buckle and attaching hardware. If any item is damaged or worn, replace the seat belt or component before operating the machine. Replace the seat belt at least once every 3 years regardless of appearance

SA-237

MOVE AND OPERATE MACHINE SAFELY

- Always be aware that there is a potential danger around the machine while operating the machine.
  - Take extra care not to run over bystanders. Confirm the location of bystanders before moving, swinging, or operating the machine.
  - Always keep the travel alarm and horn in working condition (if equipped).
  - Before starting to move or operate the machine, sound the travel alarm and horn to alert bystanders.
  - Use a signal person when moving, swinging, or operating the machine in congested areas. Locate the signal person so that the operator can always witness the signal person.
  - Coordinate the meanings of all safety signs, hand signals and marks before starting the machine. Appoint a person who is responsible to make a signal and/or guidance.
  - Never allow any persons or obstacles to enter the machine operation areas.
  - Use appropriate illuminations.

SA-1291

OPERATE ONLY FROM OPERATOR'S SEAT

- Inappropriate engine starting procedures may cause the machine to runaway, possibly resulting in serious injury or death.
  - Start the engine only when seated in the operator's seat.
  - NEVER start the engine while standing on the tracks or on ground.
  - Do not start engine by shorting across starter terminals. A hazardous situation may be created and/or possible damage to the machine may result.
  - Before starting the engine, confirm that all control levers are in neutral.

SA-444

JUMP STARTING

- Failure to follow correct jump starting procedures could result in a battery explosion or a runaway machine.
  - If the engine must be jump started, be sure to follow the instructions shown in the “OPERATING THE ENGINE” chapter.
  - The operator must be seated in the operator’s seat so that the machine will be under control when the engine starts. Jump starting is a two-person operation.
  - Never use a frozen battery.
  - Failure to follow correct jump starting procedures could result in a battery explosion or a runaway machine.

SA-032

KEEP RIDERS OFF MACHINE

- Riders on machine are subject to injury such as being struck by foreign objects and being thrown off the machine.
  - Riders also obstruct the operator’s view, resulting in the machine being operated in an unsafe manner.
  - Only allow the operator is allowed on the machine. Keep riders off.

SA-1292

INVESTIGATE JOB SITE BEFOREHAND

SA-1293

- When working at the edge of an excavation or on a road shoulder, the machine could tip over due to collapse of the ground, possibly resulting in serious injury or death.
  - Investigate the configuration and ground conditions of the job site beforehand to prevent the machine from falling and to prevent the ground, stockpiles, or banks from collapsing.
  - Make a work plan. Use machines appropriate to the work and job site.
  - Reinforce ground, edges, and road shoulders as necessary. Keep the machine well back from the edges of excavations and road shoulders.
  - When working on an incline or on a road shoulder, employ a signal person as required.
  - Never allow bystanders to enter the working area such as swing radius or traveling range.
  - Confirm that your machine is equipped a FOPS cab before working in areas where the possibility of falling stones or debris exist.
  - When the footing is weak, reinforce the ground before starting work.
  - When working on frozen ground, be extremely alert. As ambient temperatures rise, footing may become loose and slippery.
  - When operating the machine near open flame, sparks, and/or dead grass, a fire may easily break out. Use special care not to cause a fire.

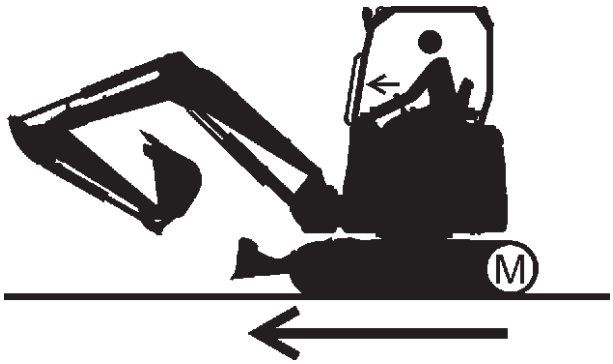
PROVIDE SIGNALS FOR JOBS INVOLVING MULTIPLE NUMBERS OF MACHINES

- In case more than one machine is operated in the same job site, accidental collision between machines may cause serious injury or death.
- For jobs involving multiple numbers of machines, provide signals commonly known by all personnel involved. Also, appoint a signal person to coordinate the job site. Make sure that all personnel obey the signal person's directions.

SA-481

CONFIRM DIRECTION OF MACHINE TO BE DRIVEN

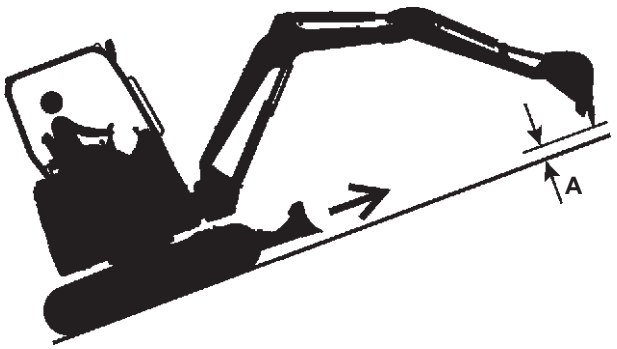
- Incorrect travel pedal/lever operation may result in serious injury death.
  - Before driving the machine, confirm the position of the undercarriage in relation to the operator's position.
  - If the travel motors are located towards the front of the cab, the machine will move in the reverse direction when travel pedals/levers are operated.



SA-1294

DRIVE MACHINE SAFELY

- Driving the machine in the incorrect direction may result in serious injury or death and/or severe damage to property.
- Before moving the machine, confirm which way to move travel pedals/levers for the corresponding direction you wish to travel.
  - Avoid passing over any obstructions. Failure to do so may cause soil, rock fragments and/or metal pieces to be scatter around the machine. Keep bystanders away from the machine.
- Traveling on a grade may cause the machine to slip or to overturn, possibly resulting in serious injury or death.
  - When traveling up or down a grade, keep the bucket in the direction of travel, approximately 200 to 300 mm (8 to 12 in) (A) above the ground so that lowering the bucket onto the ground can quickly stop the machine.
  - If machine starts to skid or becomes unstable, lower the bucket immediately.
  - Traveling across the face of slope or steering on a slope may cause the machine to skid or to turnover. If the direction must be changed on a slope, first move the machine to level ground, then, change the traveling direction to ensure safe operation.



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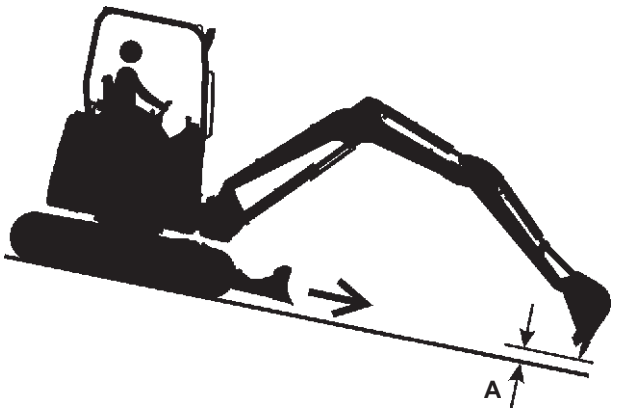
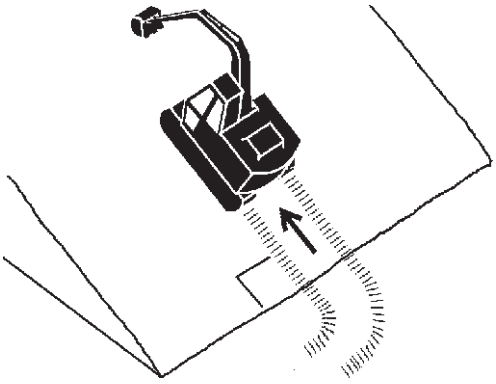
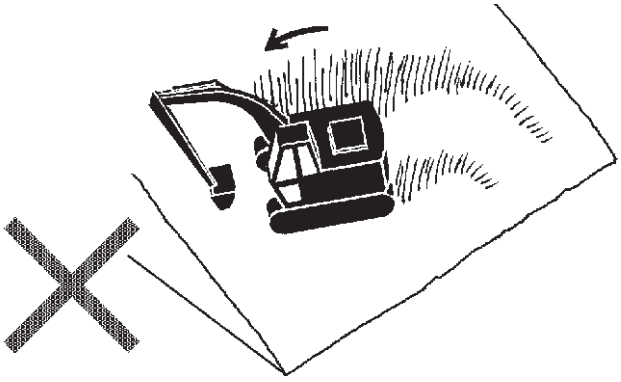


SA-1296



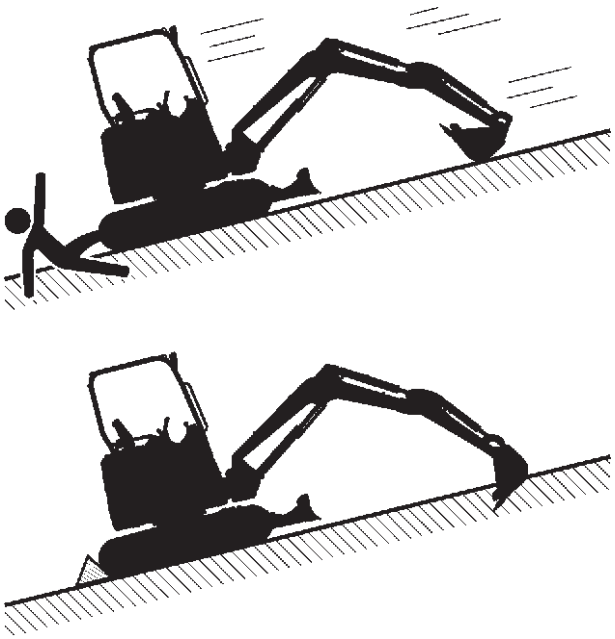
SA-441



SA-442

AVOID INJURY FROM ROLLAWAY ACCIDENTS

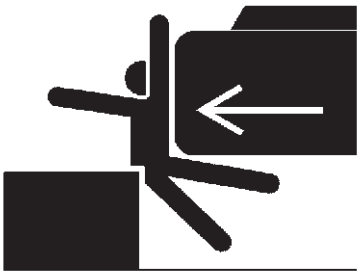
- Death or serious injury may result if you attempt to mount or try to bodily stop a moving machine.
- Park the machine in compliance with the safe parking procedures described on page S-15 to prevent the machine from running away.
  - Block both tracks and lower the bucket to the ground, thrust the bucket teeth into the ground if you must park on a grade.
  - Park a reasonable distance from other machines.



SA-1297

AVOID INJURY FROM BACK-OVER AND SWING ACCIDENTS

SA-383



SA-384

- If any person is present near the machine when backing or swinging the upperstructure, the machine may hit or run over that person, resulting in serious injury or death.

  To avoid back-over and swing accidents:
  - Always look around BEFORE YOU BACK UP AND SWING THE MACHINE. BE SURE THAT ALL BYSTANDERS ARE CLEAR.
  - Keep the travel alarm in working condition (if equipped).
    ALWAYS BE ALERT FOR BYSTANDERS MOVING INTO THE WORK AREA. USE THE HORN OR OTHER SIGNAL TO WARN BYSTANDERS BEFORE MOVING MACHINE.
  - USE A SIGNAL PERSON WHEN BACKING UP IF YOUR VIEW IS OBSTRUCTED. ALWAYS KEEP THE SIGNAL PERSON IN VIEW.
    Use hand signals, which conform to your local regulations, when work conditions require a signal person.
  - No machine motions shall be made unless signals are clearly understood by both signalman and operator.
  - Learn the meanings of all flags, signs, and markings used on the job and confirm who has the responsibility for signaling.
  - Keep windows, mirrors, and lights clean and in good condition.
  - Dust, heavy rain, fog, etc., can reduce visibility. As visibility decreases, reduce speed and use proper lighting.
  - Read and understand all operating instructions in the operator’s manual.

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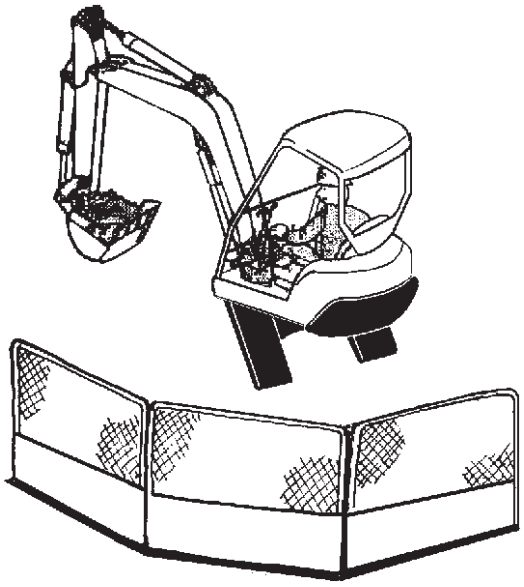
KEEP PERSONNEL CLEAR FROM WORKING AREA

- If a person is present near the operating machine, the person may come in contact with the swinging front attachment or counterweight and/or may be crushed against an other object, resulting in serious injury or death.
  - Before operating the machine, set up barriers to the sides and rear area of the bucket swing radius to prevent anyone from entering the work area.
  - Make sure that no personnel other than the signal person or no obstacles are present in the working area before operating the machine.



SA-667

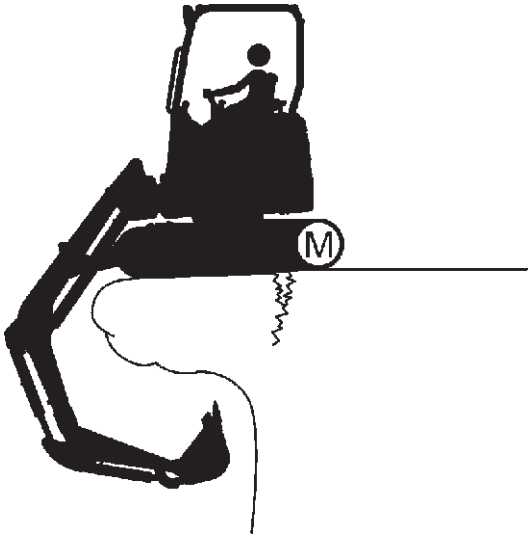
NEVER POSITION BUCKET OVER ANYONE

- Never lift, move, or swing bucket above anyone or a truck cab.
  Serious injury or machine damage may result due to bucket load spill or due to collision with the bucket.
  - Never allow the bucket to pass over anyone to avoid personal injury or death.

SA-668

AVOID UNDERCUTTING

- In order to retreat from the edge of an excavation if the footing should collapse, always position the undercarriage perpendicular to the edge of the excavation with the travel motors at the rear.
  - If the footing starts to collapse and if retreat is not possible, do not panic raise the front attachment with a panic. Lowering the front attachment may be safer in most cases.



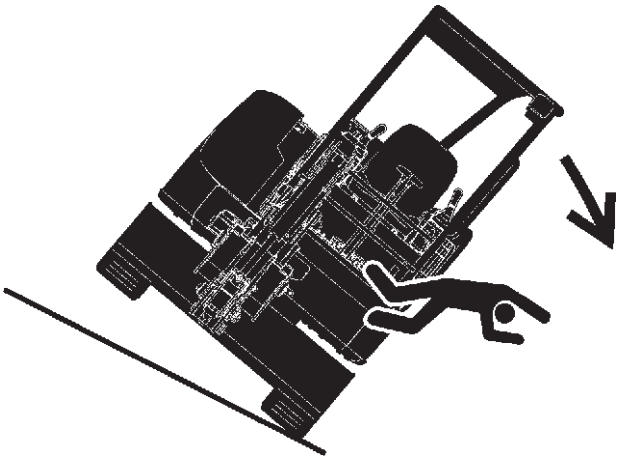
SA-1300

AVOID TIPPING

- The danger of tipping is always present when operating on a grade, possibly resulting in serious injury or death.

To avoid tipping:

- Be extra careful before operating on a grade.
  - Prepare machine operating area flat.
  - Keep the bucket low to the ground and close to the machine.
  - Reduce operating speeds to avoid tipping or slipping.
  - Avoid changing direction when traveling on grades.
  - NEVER attempt to travel across a grade steeper than 15 degrees if crossing the grade is unavoidable.
  - Reduce swing speed as necessary when swinging loads.
- Be careful when working on frozen ground.
  - Temperature increases will cause the ground to become soft and make ground travel unstable.



SA-1301

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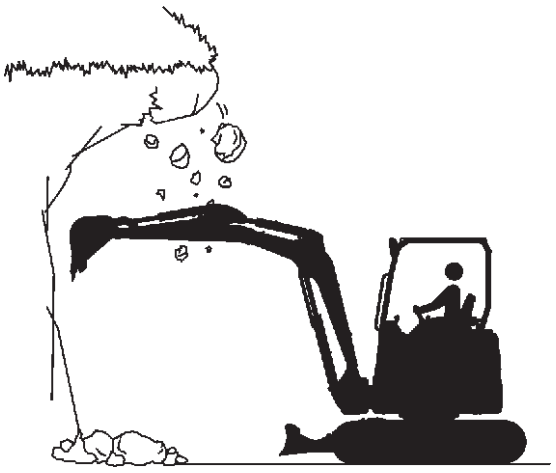
NEVER UNDERCUT A HIGH BANK

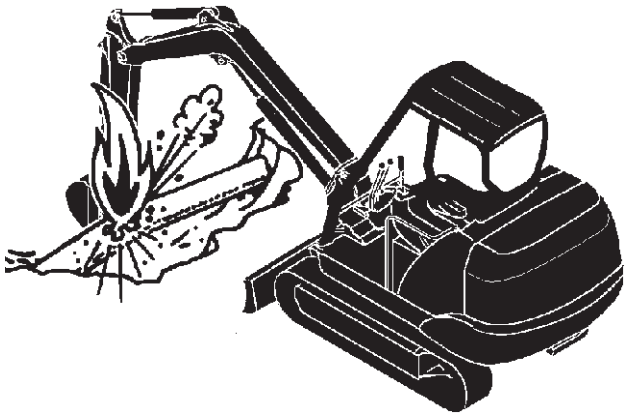
- The edges could collapse or a land slide could occur causing serious injury or death.



SA-1302

DIG WITH CAUTION

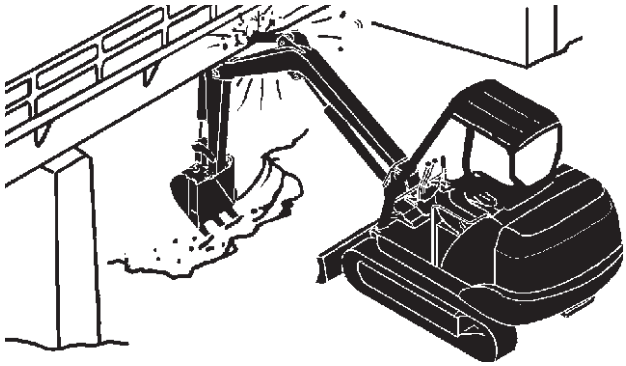
- Accidental severing of underground cables or gas lines may cause an explosion and/or fire, possibly resulting in serious injury or death.
  - Before digging check the location of cables, gas lines, and water lines.
  - Keep the minimum distance required, by law, from cables, gas lines, and water lines.
  - If a fiber optic cable should be accidentally severed, do not look into the end. Doing so may result in serious eye injury.
  - Contact your local “diggers hot line” if available in your area, and/or the utility companies directly. Have them mark all underground utilities.



SA-672

OPERATE WITH CAUTION

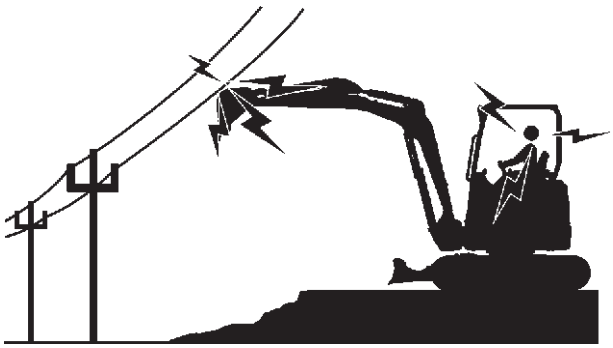
- If the front attachment or any other part of the machine hits against an overhead obstacle, such as a bridge, both the machine and the overhead obstacle will be damaged, and personal injury may result as well.
  - Take care to avoid hitting overhead obstacles with the boom or arm.



SA-673

AVOID POWER LINES

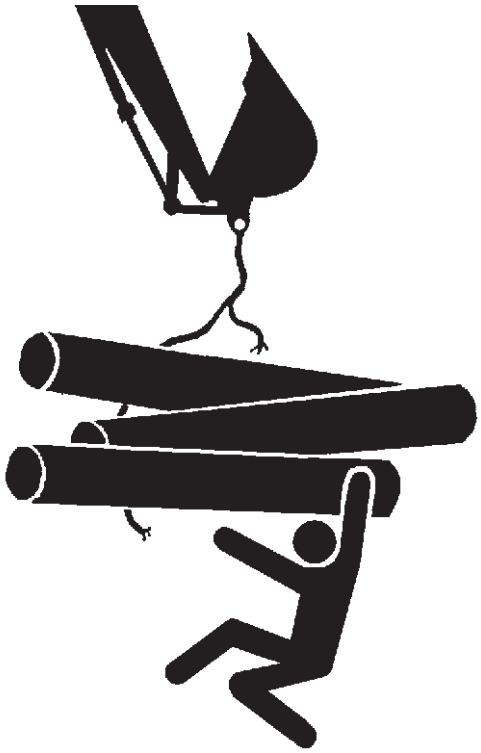
- Serious injury or death can result if the machine or front attachments are not kept a safe distance from electric lines.
  - When operating near an electric line, NEVER move any part of the machine or load closer than 3 m (10 ft) plus twice the line insulator length.
  - Check and comply with any local regulations that may apply.
  - Wet ground will expand the area that could cause any person on it to be affected by electric shock. Keep all bystanders or co-workers away from the site.



SA-1305

DO NOT USE FOR CRANING OPERATIONS

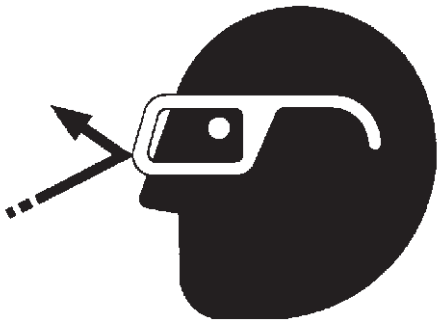
- NEVER use the machine for craning operations. If the machine is used for craning operations, the machine may tip over and/or lifted load may fall, possibly resulting in serious injury or death.
- This machine has been exclusively designed to engage in excavation and loading works.
- This machine is not equipped with any of the necessary safety devices that could allow the machine to be used for craning operation.



SA-014

PROTECT AGAINST FLYING DEBRIS

- If flying debris such as soil, rock fragments or metal pieces hit eyes or any other part of the body, serious injury may result.
  - Guard against such injuries when working in a job site where possibility of flying pieces of metal or debris exist, or when removing or installing pins using a hammer; wear goggles or safety glasses.
  - Keep bystanders away from the working area before striking any object.



SA-432

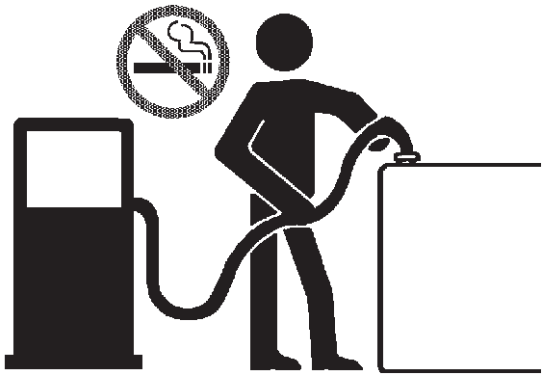
PARK MACHINE SAFELY

- Unless the machine is not correctly parked, any hazardous situations such as running away of the machine or damage by vandalism may result, causing the machine to operate unsafely when the engine is re-started. Follow instructions described below when parking the machine.
  - Park the machine on solid level surface to prevent the machine from running away.
  - Lower the bucket and/or blade to the ground.
  - Pull the lock lever to the LOCK position.
  - Turn the auto-idle switch (optional) OFF. Failure to do so may create a hazarduos condition as the engine speed may unexpectedly increase.
  - Run engine at slow idle speed without load for 5 minutes.
  - Turn key switch to OFF to stop engine. Remove the key from the key switch.
  - Before leaving the machine, close all windows, roof vent, and cab door. Lock all access doors and compartments

SA-1306

HANDLE FLUIDS SAFELY --- AVOID FIRES

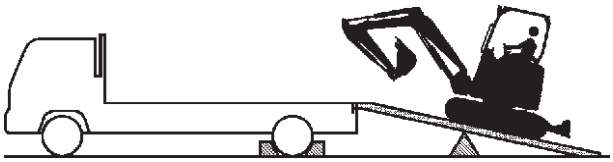
- Handle fuel with care; it is highly flammable. If fuel ignites, an explosion and/or a fire may occur, possibly resulting in serious injury or death.
  - Do not refuel the machine while smoking or when near open flame or sparks.
  - Always stop the engine before refueling the machine.
  - Fill the fuel tank outdoors.
- All fuels, most lubricants, and some coolants are flammable.
  - Store flammable fuels well away from fire hazards.
  - Do not incinerate or puncture pressurized containers.
  - Do not store oily rags; they can ignite and burn spontaneously.



SA-018

SA-019

SAFETY TRANSPORTING

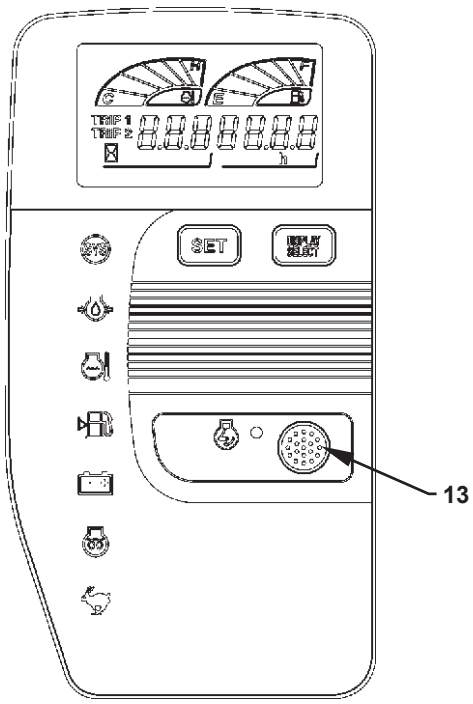


SA-1307

- The danger of tipping is present when loading/unloading the machine onto/from a truck or trailer bed.
  - Be sure to observe local regulations when transporting the machine on public roads.
  - Provide an appropriate truck or trailer for transporting the machine.
  - Be sure to have a signal person.
  - Take the following precautions when loading/unloading the machine.

1. Select firm level ground.
2. Be sure to use a loading dock or ramp strong enough to support the machine weight.
3. Ramps must be sufficient in width, length, and strength. Be sure that the incline of the ramp is less than 15 degrees.
4. Loading docks must be sufficient in width and strength to support the machine and have a gradient of less than 15 degrees.
5. Be sure to turn the auto-idle switch (13) OFF.
6. Slowly drive the machine.
7. Avoid steering while driving up or down the ramp as it is extremely dangerous. If steering is unavoidable, first move back to the ground or flatbed, modify traveling direction, and begin to drive again.
8. The top end of the ramp where it meets the flatbed is a sudden bump. Take care when traveling over it.
9. Wedge the front and rear of tracks. Securely fasten the machine to the trailer bed with chain or cables.
10. Do not operate any levers besides the travel levers when driving up or down the ramp.
11. Prevent possible injury from machine tipping while the upperstructure is rotating.
12. Keep the arm tucked under and rotate the upperstructure slowly for best stability.

Refer to "transporting" chapter in operator's manual for details

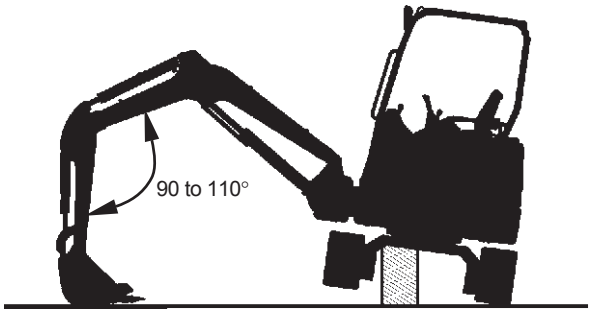


M1M7-01-028

PRACTICE SAFE MAINTENANCE

- Inspection/maintenance work may produce hazardous situations by contacting and/or accessing a part of body to a moving, high pressure, and/or high temperature part of the machine. To avoid serious personal injury or death, follow the instructions described below.
  - Thoroughly coordinate the working procedures to be taken hereafter with the co-workers before beginning work such as inspecting/servicing the machine, or replacing the attachiment .
  - Safely park the machine in accordance with the instructions for “Park Machine Safely.”
  - Keep the work area clean and orderly.
  - Attach a “DO NOT OPERATE” tag in an easy-to-see location such as on a door or a control lever.
  - If moisture permeates into the electrical system, malfunction and/or erroneous movement of the machine may result. Do not clean sensors, cable connectors, and the cab inside using water and/or steam.
  - Wait to begin to work until the engine and hydraulic oil temperatures have cooled down to the safety range.
  - In case inspection/maintenance must be performed with the engine runnning, be sure to appoint an overseer.
  - Never lubricate or service the machine while moving it.
  - Repair the cracked windowpane before servicing the machine. Failure to do so may cause personal injury.
  - Whe raising the machine above the ground using the front attachment function, maintain the angle between the boom and the arm in the range of 90 to 110°. Never allow anyone to enter under the machine raised with the front attachment function.
  - In case working under the machine raised above the ground is unavoidably required, securely hold the machine with stays or blocks strong enough to support the machine weight.
  - Never work under the raised bucket.
  - Keep all parts in good condition and properly installed.
  - Always use the specified tools correctly.
  - Always use a clean tool.
  - Fix any damage found immediately. Replace worn or broken parts.
  - Remove any buildup of grease, oil, or debris.
  - When cleaning parts, use a non-combustible cleaning solvent. Never use an inflammable fluid such as dieasel fuel, or gasoline.

SA-028



M1M7-04-006

SA-527

- Disconnect battery ground cable (–) before making adjustments to electrical systems or before welding on the machine.
- Sufficiently illuminate the work site. Use a maintenance work light when working under or inside the machine.
- Always use a work light protected with a guard. In case the light bulb is broken, spilled fuel, oil, antifreeze fluid, or window washer fluid may catch fire.

SA-037

WARN OTHERS OF SERVICE WORK

- Unexpected machine movement can cause serious injury.
  - Before performing any work on the machine, attach a “Do Not Operate” tag in an easy-to-see place such as on the cab door or control lever.
  - Never attempt to operate the machine with a “Do Not Operate” tag attached.
  - Make it a rule for the inspection/service person to hold the engine start key during inspection/service work.

SA-287

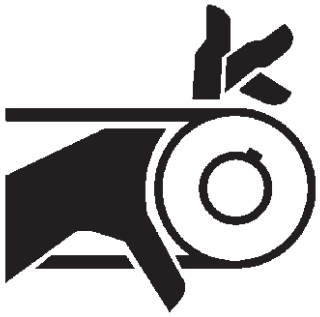
SUPPORT MACHINE PROPERLY

- Never attempt to work on the machine without securing the machine first.
  - Always lower the attachment to the ground before you work on the machine.
  - If you must work on a lifted machine or attachment, securely support the machine or attachment with stays or blocks strong enough to support the machine and/or attachment weight.

SA-527

STAY CLEAR OF MOVING PARTS

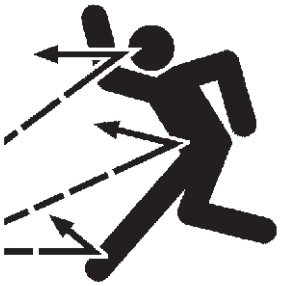
- Contact with moving parts can cause serious injury or death due to amputation or entanglement.
  - To prevent accidents, care should be taken to ensure that hands, feet, clothing, jewelry and hair do not become entangled when working around rotating parts.



SA-026

PREVENT PARTS FROM FLYING

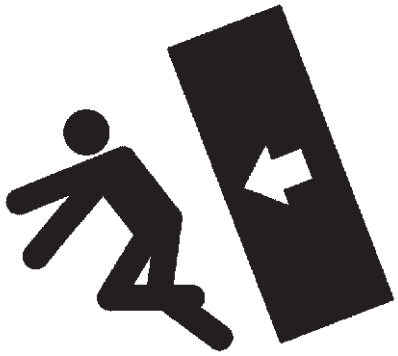
- Grease in the track adjuster is under high pressure. Failure to follow the precautions below may result in serious injury, blindness, or death.
  - Do not attempt to remove GREASE FITTINGS or VALVE ASSEMBLIES.
  - As pieces of parts may fly off, be sure to keep body and face away from the valve.
- Travel reduction gears are under pressure.
  - As pieces of parts may fly off, be sure to keep body and face away from AIR RELEASE PLUG to avoid injury.
  - GEAR OIL is hot. Wait for gear oil to cool, then gradually loosen the air release plug to release pressure.



SA-344

STORE ATTACHMENTS SAFELY

- Stored attachments such as buckets, hydraulic hammers, and blades can fall and cause serious injury or death.
  - Securely store attachments and implements to prevent falling accidents.
  - Keep children and bystanders away from storage areas.



SA-034

PREVENT BURNS

Hot spraying fluids:

- After operation, engine coolant is hot and under pressure. Hot water or steam is contained in the engine, radiator and heater lines.
  Skin contact with escaping hot water or steam can cause severe burns.

  - To prevent possible injury from hot spraying water, stop the engine. Begine to work after the engine and radiator are sufficiently cooled
  - DO NOT remove the radiator cap until the engine is cool. When opening, turn the cap slowly to the stop. Allow all pressure to be release before removing the cap.
  - The hydraulic oil tank is pressurized. Again, be sure to release all pressure by slowly removing the cap.

SA-039

Hot fluids and surfaces:

- Engine oil, gear oil and hydraulic oil also becomes hot during operation.
  The engine, hoses, lines and other parts become hot as well.

  - Wait for the oil and components to cool before starting any maintenance or inspection work.

SA-225

REPLACE RUBBER HOSES PERIODICALLY

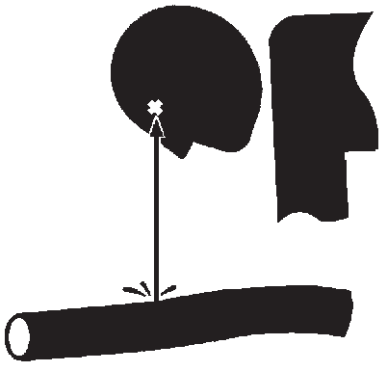
- Rubber hoses that contain flammable fluids such as hydraulic oil or fuel under pressure may break due to aging, fatigue, and abrasion. It is very difficult to gauge the extent of deterioration due to aging, fatigue, and abrasion of rubber hoses by visual inspection alone.
  - Periodically replace the rubber hoses. (Refer to the “Periodical Replacement Parts” section in the operator’s manual.)
- Failure to periodically replace rubber hoses may cause a fire, fluid injection into skin, or the front attachment to fall on a person nearby, which may result in severe burns, gangrene, or otherwise serious injury or death.

SA-019

AVOID HIGH-PRESSURE FLUIDS

- Fluids such as diesel fuel or hydraulic oil under pressure can penetrate the skin or eyes causing serious injury, blindness or death.
  - Avoid this hazard by relieving pressure before disconnecting hydraulic or other lines. Make sure that all connectors are completely connected before applying pressure.
  - Search for leaks with a piece of cardboard; take care to protect hands and body from high-pressure fluids. Wear a face shield or goggles for eye protection.
  - If an accident occurs, see a doctor familiar with this type of injury immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result.

SA-031



SA-292

SA-044

PREVENT FIRES

Check for Oil Leaks:

- Fuel, hydraulic oil and lubricant leaks can lead to fires, possibly resulting in personal injury or death.
  - Check for missing or loose clamps, kinked hoses, lines or hoses that rub against each other, damage to the oil-cooler, and loose oil-cooler flange bolts, for oil leaks.
  - Tighten, repair or replace any missing, loose or damaged clamps, lines, hoses, oil-cooler and oil-cooler flange bolts.
  - Do not bend or strike high-pressure lines.
  - Never install bent or damaged lines, pipes or hoses.

SA-019

Check for Shorts:

- Short circuits can cause fires.
  - Clean and tighten all electrical connections.
  - Check before each shift or after eight (8) to ten (10) hours operation for loose, kinked, hardened or frayed electrical cables and wires.
  - Check before each shift or after eight (8) to ten (10) hours operation for missing or damaged terminal caps.
  - DO NOT OPERATE MACHINE if cable or wires are loose, kinked, etc.

Precautions for Handling Flammables

- Spilled fuel and oil, and trash, grease, debris, accumulated coal dust, and other flammables may cause fires.

  - Prevent fires by inspecting and cleaning the machine daily, and by removing spilled or accumulated flammables immediately.
  - Don't store flammable fluid near open flames.
  - Don't burn or crush a pressurerized container.
  - Don't store oily cloths. They are liable to catch fire.
  - Don't wind easy-to-absorb-oil asbestos or glass wool around high-temperature parts such as a muffler or exhaust pipe.

Check Heat Shield Covers around Engine Compartment

- If the engine compartment heat shield cover becomes broken or lost, fire may break out.

  - If the engine compartment heat shield cover becomes broken or lost, repair or replace it before operating the machine.

Check Key Switch:

- If fire breaks out, failure to stop the engine will escalate the fire, hampering fire fighting.

  - Always check key switch function before operating the machine every day:

  1) Start the engine and run it at slow idle.
  2) Turn the key switch to the OFF position to confirm that the engine hasstopped.

  If any abnormalities are found, be sure to repair them before operating the machine.

EVACUATING IN CASE OF FIRE

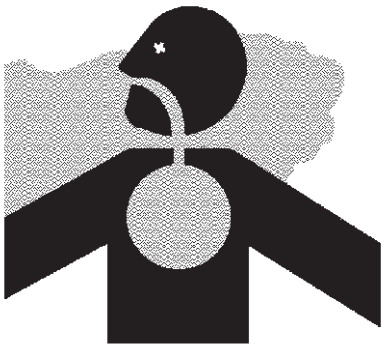
- If fire breaks out during machine operation, evacuate the machine in the following way:
  - Stop the engine by turning the key switch to the OFF position.
  - Use a fire extinguisher if there is time.
  - Exit the machine using handrails and/or steps.
  - In an emergency, if the cab door or front window can not be opened, break the front or rear window panes with the emergency evacuation hammer to escape from the cab.
    Refer to the explanation pages on the “Emergency Evacuation Method” in the operator’s manual.

SA-393

SS-1510

BEWARE OF EXHAUST FUMES

- Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.
  - If you must operate the machine in a building, be sure there is adequate ventilation. Either use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring enough outside air into the area.



SA-016

PRECAUTIONS FOR WELDING AND GRINDING

SA-818

- Welding may generate gas and/or small fires.
  - Be sure to perform welding in a well ventilated and prepared area. Store flammable objects in a safe place before starting welding.
  - Only qualified personnel should perform welding. Never allow an unqualified person to perform welding.
- Grinding on the machine may create a fire hazard. Store flammable objects in a safe place before starting grinding.
- After finishing welding and grinding, recheck that there are no abnormalities such as the area surrounding the welded area still smoldering.

AVOID HEATING NEAR PRESSURIZED FLUID LINES

SA-030

- Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders.
  - Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials.
  - Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area. Install temporary fire resistant guards to protect hoses or other materials before engaging in welding, soldering, etc.

AVOID APPLYING HEAT TO LINES CONTAINING FLAMMABLE FLUIDS

- Do not weld or flame cut pipes or tubes that contain flammable fluids.
- Remove flammable fluids thoroughly with nonflammable solvent before welding or flame cutting pipes or tubes that contained flammable fluids.

REMOVE PAINT BEFORE WELDING OR HEATING

SA-029

- Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch. If inhaled, these fumes may cause sickness.
  - Remove paint before welding or heating.
  - Avoid potentially toxic fumes and dust.
  - Do all such work outside or in a well-ventilated area. Dispose of paint and solvent properly.
  - Allow fumes to disperse at least 15 minutes after welding or heating.
  - Use attention to the following points when removing paint.

1. If you sand or grind paint, avoid breathing the dust which is created.
   Wear an approved respirator.
2. If you use solvent or paint stripper, remove stripper with soap and water before welding.
3. Remove solvent or paint stripper containers and other flammable material from area.

PREVENT BATTERY EXPLOSIONS

SA-032

- Battery gas can explode.
  - Keep sparks, lighted matches, and flame away from the top of battery.
  - Never check battery charge by placing a metal object across the posts. Use a voltmeter or hydrometer.
  - Do not charge a frozen battery or start engine with frozen battery.
    There is fear of explosion. If battery electrolyte is frozen, wait until it is liquefied completely in an atmospheric temperature room.
  - Do not continue to use or charge the battery when the electrolyte level is lower than specified. Explosion of the battery may result.
  - When a terminal become loose, it may induce sparks. Securely tighten all terminals.
- Battery electrolyte is poisonous. If the battery should explode battery electrolyte may be splashed into eyes, possibly resulting in blindness. If electrolyte is splashed into eyes, flush your eyes continuosly with water for about 15 minutes. Seek medical attention immediately.
  - Be sure to wear eye protection when checking electrolyte specific gravity.

PRECAUTIONS FOR HANDLING REFRIGERANT

- If refrigerant is splashed into eyes or spilled onto skin, blindness or a cold contact burn may result.
  - Refer to the precautions described on the refrigerant container for handling refrigerant.
  - Use a recovery and recycling system to avoid venting refrigerant into the atmosphere.
  - Never allow the skin to directly come in contact with refrigerant.

SA-405

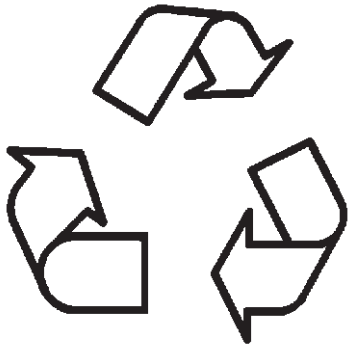
HANDLE CHEMICAL PRODUCTS SAFELY

- Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with your machine include such items as lubricants, electrolyte, coolants, paints, and adhesives.
  - A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.
  - Check the MSDS before you start any job using a hazardous chemical. Then follow the correct procedures and use recommended equipment.
  - See your nearest Hitachi dealer for MSDS.

SA-309

DISPOSE OF WASTE PROPERLY

- Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with HITACHI equipment includes such items as oil, fuel, coolant, brake fluid, filters, and batteries.
  - When draining fluid, use a leakproof container with a capacity larger than the drained fluid volume to receive it.
  - Do not pour waste onto the ground, down a drain, or into any water source.
  - Inquire on the proper way to dispose of harmful waste such as oil, fuel, coolant, brake fluid, filters, and batteries from your local environmental or recycling center.



SA-226

BEFORE RETURNING THE MACHINE TO THE CUSTOMER

- After maintenance or repair work is complete, confirm that:
  - The machine is functioning properly, especially the safety systems.
  - Worn or damaged parts have been repaired or replaced

SA-435

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SECTION AND GROUP CONTENTS

SECTION 1 GENERAL INFORMATION

WORKSHOP MANUAL

SECTION 2 UPPERSTRUCTURE

SECTION 3 UNDERCARRIAGE

All information, illustrations and specifications in this manual are based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice.

SECTION 4 FRONT ATTACHMENT

SECTION 5 ENGINE

TECHNICAL MANUAL

SECTION 1
GENERAL INFORMATION

— CONTENTS —

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PRECAUTIONS FOR DISASSEMBLING AND ASSEMBLING

Precautions for Disassembling and Assembling

- Clean the Machine

  Thoroughly wash the machine before bringing it into the shop. Bringing a dirty machine into the shop may cause machine components to be contaminated during disassembling/assembling, resulting in damage to machine components, as well as decreased efficiency in service work.

- Inspect the Machine

  Be sure to thoroughly understand all disassem-bling/assembling procedures beforehand, to help avoid incorrect disassembling of components as well as personal injury.
  Check and record the items listed below to prevent problems from occurring in the future.

  - The machine model, machine serial number, and hour meter reading.
  - Reason for disassembly (symptoms, failed parts, and causes).
  - Clogging of filters and oil, water or air leaks, if any.
  - Capacities and condition of lubricants.
  - Loose or damaged parts.

- Prepare and Clean Tools and Disassembly Area

  Prepare the necessary tools to be used and the area for disassembling work.

- Precautions for Disassembling

  - To prevent dirt from entering, cap or plug the removed pipes.
  - Before disassembling, clean the exterior of the components and place on a work bench.
  - Before disassembling, drain gear oil from the reduction gear.
  - Be sure to provide appropriate containers for draining fluids.
  - Use matching marks for easier reassembling.
  - Be sure to use the specified special tools, when instructed.
  - If a part or component cannot be removed after removing its securing nuts and bolts, do not attempt to remove it forcibly. Find the cause(s), then take the appropriate measures to remove it.
  - Orderly arrange disassembled parts. Mark and tag them as necessary.
  - Store common parts, such as bolts and nuts with reference to where they are to be used and in a manner that will prevent loss.
  - Inspect the contact or sliding surfaces of disassembled parts for abnormal wear, sticking, or other damage.
  - Measure and record the degree of wear and clearances.

- Precautions for Assembling

  - Be sure to clean all parts and inspect them for any damage. If any damage is found, repair or replace part.
  - Dirt or debris on the contact or sliding surfaces may shorten the service life of the machine. Take care not to contaminate any contact or sliding surfaces.
  - Be sure to replace O-rings, backup rings, and oil seals with new ones once they are disassembled. Apply a film of grease before installing.
  - Be sure that liquid-gasket-applied surfaces are clean and dry.
  - If an anti-corrosive agent has been used on a new part, be sure to thoroughly clean the part to remove the agent.
  - Utilize matching marks when assembling.
  - Be sure to use the designated tools to assemble bearings, bushings and oil seals.
  - Keep a record of the number of tools used for disassembly/assembly. After assembling is complete, count the number of tools, so as to make sure that no forgotten tools remain in the assembled machine.

Bleeding Air from Hydraulic System

When hydraulic oil is drained, the suction filter or the suction lines are replaced, or the removal and installation of the pump, swing motor, travel motor or cylinder is done, bleed air from the hydraulic system in the following procedures:

IMPORTANT: If the engine is started with air trapped in the hydraulic pump housing, damage to the pump may result. If the hydraulic motor is operated with air trapped in the hydraulic motor housing, damage to the motor may result. If the cylinder is operated with air trapped in the cylinder tube, damage to the cylinder may result. Be sure to bleed air before starting the engine.

- Bleeding Air from Hydraulic Pump

  - Remove the air bleeding plug from the top of the pump and fill the pump housing with hydraulic oil.
  - After the pump housing is filled with hydraulic oil, temporarily tighten the plug. Then, start the engine and run at slow idle speed.
  - Slightly loosen the plug to bleed air from the pump housing until hydraulic oil oozes out.
  - After bleeding all the air, securely tighten the plug.

- Bleeding Air from Travel Motor / Swing Motor

  - With the drain plug / hose on travel motor / swing motor removed, fill the motor case with hydraulic oil.